



Munich Personal RePEc Archive

Early and Late Demographic Transitions: the Role of Urbanization

Cuberes, David
University of Alicante (Spain)

October 2009

Online at <http://mpra.ub.uni-muenchen.de/17720/>
MPRA Paper No. 17720, posted 08. October 2009 / 16:36

Early and Late Demographic Transitions: the Role of Urbanization

David Cuberes^{*}

University of Alicante

This version: October 2009

This paper uses new estimates of the dates on which different countries have experienced their demographic transition to address two empirical questions. First, I study the importance of different socioeconomic variables on the timing of these transitions. Second, I distinguish between countries that have experienced early and late demographic transitions and compare their relative income around the transition date. My results indicate that the size of a country's urban population plays a crucial role in triggering its demographic transition. In particular, after controlling for income and total population, more urbanized countries tend to experience an earlier demographic transition. Moreover, countries that experience an early demographic transition (before 1950) are much richer than latecomers, suggesting that urbanization plays a more important role than income in the latter. One interpretation of these results is that a country's level of income and rate of urbanization are substitutable factors that trigger the country's demographic transition. Finally, if one accepts the premise that urban agglomerations enhance both technological progress and the demand for human capital, the results provide indirect support for theories that highlight these factors as triggers of the demographic transition or the escape from Malthusian traps.

JEL classification: J10, N10, O18

Keywords: urbanization, demographic transition, rural-urban migration, Malthusian traps

1. Introduction

The demographic transition, often known as the sustained decline in a given country's population growth rate,¹ has been extensively studied by demographers and, more recently, by economists. Most existing studies, as summarized below, focus on the experiences of a few European countries during the nineteenth century. The case of developing countries has been much more difficult to analyze because the demographic transition has just begun in many of them and reliable data are scarce.

^{*}I thank Nicholas Crafts and Andrew Mountford for valuable comments on an earlier draft of the paper. I acknowledge financial support from the Ministerio de Ciencia y Tecnología (proyecto SEJ2007-62656).

¹A more accurate definition of the demographic transition distinguishes between three different phases: the first one is characterized by high birth and death rates, and so roughly zero population growth. In the second phase, population grows as mortality falls sharply while fertility remains high. Finally, in the third phase both death and birth rates fall and so population remains roughly constant again. See Ray (1998) for a detailed description of this process. Sometimes, as is the case in this paper, the so-called demographic transition refers to only the last phase.

Moreover, the few existing cross-country studies do not offer a formal comparison between so-called “early” demographic transitions (nineteenth or early-twentieth century) and “late” ones (late-twentieth century).

This paper uses a new dataset on estimates of the demographic transition dates for a large set of countries to analyze two aspects of this unique and crucial structural change. I first examine the main determinants of *late* demographic transitions by analyzing data for mostly developing countries in the 1950-2000 period.² Next, using historical data on per-capita income, I compare the relative level of development at the time of transition in early and late episodes. I then argue that these two empirical results may be interpreted as supporting some existing theories of the demographic transition or the escape from the Malthusian trap.

The main result of the paper is that a country’s level of urban population is a very powerful explanatory variable of the cross-country differences in the year at which the demographic transition takes place. Even after controlling for a country’s per-capita gross domestic product (GDP), more urbanized countries tend to experience the demographic transition earlier than less urbanized ones.

This finding provides indirect support for theories arguing that demographic transitions are mainly driven by a rise in the demand for human capital (Galor and Weil 2000). A common element of these models is that at some point in a country’s development process, population pressure induces technological progress, which, in turn, enhances the demand for human capital.³ This translates into an increase in the return to human capital, which then induces a switch from *quantity* to *quality* of children. When a significant fraction of households decides to have fewer and more educated children, a demographic transition takes place. While these theories of demographic transition have a strong theoretical foundation, testing them empirically has proven difficult, mainly because there is a lack of accurate data on either technological progress or wages for a large enough span of countries and years. The finding that it is urban--not total--population that matters when explaining cross-country differences in the timing of the transition, and that urban population matters more than income, represents a step towards validating this type of theory.

My second result is that countries that experienced an early demographic transition were relatively much richer (i.e., compared to the average world income in the year at which they transitioned) than those that experienced it in recent years. This suggests that the importance of income as a trigger factor has declined over time and that the demand for human capital, proxied by the level of urban population, is becoming an even more important determinant for today’s developing countries.

² A lack of accurate data precludes me from extending this exercise to a sufficiently large number of *early* transitions.

³ Whether this pressure comes from a supply effect (e.g., through an increase in the probability of finding “a new Einstein”) or a demand effect (e.g., through an increase in the demand for food that stimulates technological progress) is an intriguing open question that I do not explore here. See Kremer (1993) and Boserup (1981) for an exposition of the former and latter views, respectively.

One policy implication of the paper is that developing countries that are pursuing strategies to decrease their fertility rates should encourage policies that stimulate technological progress and/or schooling, hence raising the demand for human capital. An indirect way to achieve this is to promote a sustainable rural-urban migration process.⁴

The remainder of the paper is organized as follows. The next section reviews relevant papers related to the study. The data used in the paper are described in Section 3. The two parts of the empirical study are developed in Section 4. Finally, Section 5 presents the conclusions.

2. Literature

Most empirical papers that attempt to describe cross-country differences in the demographic transition process focus on “early” transitions that took place in Europe in the late-eighteenth and early-nineteenth centuries. This is understandable, because comprehensive data for today’s developing countries, which represent the vast majority of countries that experienced their demographic transition after 1950 or have not reached it yet, have been scarce until recently. As Reher (2004) explains it: “Our understanding of the demographic transition among the latecomers is severely limited because in most of these countries it has only recently begun.” New datasets created by the World Bank, the United Nations (UN), and several authors, however, make it possible to have accurate data on different variables to test existing theories of the demographic transition or to simply characterize this process in developing countries.

Existing studies follow two very different avenues. On the one hand, demographers focus almost exclusively on the role of cultural factors, such as religion or social values, to explain these transitions. They also place much emphasis on the importance of family planning techniques and government intervention to trigger sharp falls in fertility.⁵ On the other hand, economists emphasize the importance of income and the demand for human capital to induce families to substitute *quantity* for *quality* of children.⁶ To my knowledge, however, no comprehensive, formal study uses the available data to compare the transitions of today’s developed and developing countries.

Some authors analyze the case of the United States or of some other developed country. For instance, Greenwood and Seshadri (2002) focus on the United States

⁴ One paper that advocates further rural-urban migration in China is Au and Henderson (2006). According to their calculations, existing barriers to urbanization have significantly lowered the Chinese potential GDP per capita.

⁵ See Kirk (1996) for a review of these studies.

⁶ Galor (2005) provides a very comprehensive review of different theories proposed by economists and argues against the approach taken by demographers.

experience only, whereas Manuelli and Seshadri (2009) compare the U.S. demographic transition with that of Europe in the nineteenth century.

The empirical evidence for today's developing countries is much sparser, and it reduces to a few, mostly outdated studies. Rosero-Bixby (1998) and Defo (1998) analyze this process in Costa Rica and Cameroon, respectively. In an older paper, Rutstein and Medica (1978) focus on the cases of Colombia, Costa Rica, Mexico, and Peru. Soares (2007) presents a comprehensive review of trends and causes of the reduction in mortality in developing countries, but he does not study the demographic transition *per se*. Hill and Pebley (1989) offer a comprehensive study for developing countries, but it is also quite outdated, and its main goal is to characterize child mortality in developing countries.⁷ My study is closely related to Reher (2004). Reher compares demographic transitions in Europe with those of currently developing countries, finding important similarities. He does not, however, use formal econometric techniques to analyze the role of different variables as triggers of demographic transitions.

My paper is also indirectly related to literature that examines the importance of urban agglomerations as locations that enhance technological progress (Carlino et al. 2007) and how this, in turn, generates a demand for human capital that boosts wages (Ciccone and Hall, 1996). Furthermore, the finding that the degree of urbanization is a crucial trigger of demographic transitions is consistent with several theoretical papers. Galor and Weil (2000) develop a model in which there is a positive interaction between increases in population density and technological progress. The latter ultimately generates an industrial demand for human capital and spurs further technological progress, leading to a demographic transition. The importance of urban population as a trigger factor of structural change in a country's economy is the core of Boucekkine et al. (2007), who present a model in which higher population density may trigger the transition from stagnation to growth. The mechanism through which this takes place is that higher density stimulates the creation of additional schools, and hence facilitates the switch from quantity to quality of children. Finally, de la Croix et al. (2008) find that in Sweden, during the 1800-2000 period, increases in population density raise productivity and critically contribute to the demographic transition.

My second empirical finding--that late demographic transitions have been reached at a much lower relative level of income--is reminiscent of Parente and Prescott's (2000) result that per-capita GDP in the economic miracles of the postwar grew much faster than in countries that escaped the Malthusian trap in the late-nineteenth century. Also related to the different timing of various events in today and yesterday's developing countries, Cuberes (2009) shows that urban primacy, the ratio of the population in the largest city of a country to its total or urban population, around the time of the demographic transition is much lower in late transitions than in early ones.

⁷ See also Harbison (2005), Wolpin (1997), and Bulatao and Lee (1983).

3. Data

Reher (2004) provides data on the approximate dates at which the demographic transition took place in a large set of currently developed and developing countries. Using data mostly from the UN's *Demographic Yearbook* (2000) on crude birth and infant mortality rates, he chooses these dates using the following strategy. He sets the date of the demographic transition (DT) at the beginning of the first quinquennial after a peak, where fertility declines by at least 8% over the two quinquennia and never increases again to levels approximating the original take-off point. While this strategy is arguably somewhat arbitrary, it leads to unambiguous transition dates for most developing countries, which are the focus of my study.

A list of these dates, along with a histogram that shows their distribution, can be found in Table 1A and Figure 1A of the Appendix. As shown, most transitions took place after 1950, and they concentrate in 1965 (12 cases) and 1985 (15 cases). Figure 2A in the Appendix shows data on total fertility rates and the Reher's date for a few countries. Although the chosen transition date is not always the most precise one, it is apparent that his estimates do a reasonable job at identifying a structural change in fertility behavior.⁸ For instance, while the estimate of the transition date in France is too high, the one corresponding to Botswana, India, and Mexico coincides with a clear structural change in the total fertility rates of these countries. On the other hand, Sierra Leone is an example of a country that has not yet experienced a demographic transition.

Data on total and urban population and on infant mortality rates are obtained from the UN's World Urbanization Prospects and the World Development Indicators, respectively. Finally, I use data on real per capita GDP from both Maddison (2003) and the Penn World Tables (Heston et al. 2006).

4. Empirical Strategy and Results

4.1. Determinants of the Demographic Transition

In this section I examine the main determinants of the DT date in my sample of countries. I begin by simply regressing the DT date on historical real per-capita income using Maddison data for the 1850-2000 period. I estimate the following model:

$$\ln(DT) = \alpha + \beta_1 \ln \bar{y} + \varepsilon \quad (1)$$

⁸ A more careful look at the data reveals that his estimates are indeed reasonably accurate. This analysis is available upon request.

where DT is Reher's estimate of the demographic transition date; \bar{y} is the country's average per-capita income in the years previous to its transition date; and ε is a standard error term.

I first run the regression for the entire sample and then explore whether the effect of y is different in early transitions than in late ones. To accomplish the latter, I define the dummy variable D_{early} that takes value of one if the transition date is before the median transition date (1980 in the sample), and zero otherwise, and interact it with per-capita income y .⁹

$$\ln(DT) = \alpha + \beta_1 \ln \bar{y} + \beta_2 \ln(D_{early} * \bar{y}) + \varepsilon \quad (2)$$

This division leads to 61 early and 48 late transitions. Table 2A in the Appendix lists the countries that belong to each group. The estimates of regressions (1) and (2) are displayed in Table 1.

Table 1: The Effect of Per-Capita GDP on the Timing of the Demographic Transition Using Maddison Data

	[1]	[2]
log of Average GDPpc	-0.006*** (0.002)	0.004 (0.002)
log of Avg GDPpc*Dummy_Early		-0.003*** (0.0003)
constant		7.59*** (0.01)
Method of estimation	OLS	OLS
Number of observations	110	110
R ²	0.07	0.48

Note: Robust standard errors are in parentheses. *** denotes significance at the 1% level.

The first column of the table shows that, without controlling for anything else, a country's level of income is an important determinant of the date at which it reaches its DT. Richer countries tend to experience the transition significantly earlier than poorer ones. The second column indicates that the importance of income as a determinant of the DT is more pronounced in "early" DTs (those that took place in 1980 or earlier).

Next I add two explanatory variables to the previous regression: the country's total population and urban population. These are indicators that, according to some of the economic theories summarized above, should be important triggers of the DT:

⁹ Choosing 1950 as the critical transition date that defines early and late transitions does not change the qualitative results of Table 1.

$$\ln(DT) = \alpha + \beta_1 \ln \bar{y} + \beta_2 \ln \bar{N} + \beta_3 \ln \bar{U} + \varepsilon \quad (2)$$

where, as before, DT is Reher's estimate of the demographic transition date and \bar{y} is average GDP per capita; \bar{N} and \bar{U} denote average total and rural population, respectively; and ε is a standard error term.

Note that reliable data on urban population for a large set of countries are available only for the 1950-2000 period. This, together with the fact that the DT in most of today's developed countries took place prior to 1950, implies that the regression above is estimated using mainly today's developing countries.¹⁰ Finally, because the data on per-capita GDP are more comprehensive in the Penn World Table (PWT) dataset than in the Maddison one for this time interval, I use the former in the estimation.¹¹ Table 2 shows the OLS estimates of (2).

Table 2: The Effect of Per-Capita GDP and Total and Urban Population on the Timing of the Demographic Transition Using PWT Data

	[1]	[2]	[3]	[4]
log of Average GDPpc	0.002** (0.0007)	0.001* (0.0008)	0.004*** (0.0009)	0.004*** (0.001)
log of Avg Total Population		-0.0005 (0.0005)		-0.0003 (0.0005)
log of Avg Urban Population			-0.006*** (0.001)	-0.006*** (0.001)
constant	7.58*** (0.005)	7.59*** (0.01)	7.55*** (0.007)	7.56*** (0.01)
Method of estimation	OLS	OLS	OLS	OLS
Number of observations	79	79	79	79
R ²	0.05	0.06	0.29	0.3

Note: Robust standard errors are in parentheses. **, *** denote significance at the 5% and 1% levels, respectively.

First, notice that the coefficient on per-capita GDP is now always positive and significant. This is in sharp contrast with the estimates of the first column of Table 1, which show a strong negative correlation between a country's income and the date at which it reaches the demographic transition. This can be explained by the fact that, as argued above, Table 2 contains mainly what we currently call developing countries, whereas Table 1 uses both developed and developing countries. For today's developing countries, a higher income delays rather than anticipates the demographic

¹⁰ The sample size drops from 110 to 79 from regression (1) to (2).

¹¹ Estimates using the Maddison dataset are quite similar to the ones reported here and are available upon request.

transition. Notice that once one controls for early and late transitions, per-capita income is no longer significant in the second column of Table 1, which confirms this hypothesis.

In specification [2], total population is not statistically significant. This may reflect the fact that, by construction, per-capita GDP (the ratio of GDP and total population) and total population are highly negatively correlated. Alternatively, it may suggest that a country's total population level is indeed a poor predictor of its transition date. Specifications [3] and [4] show a central result of the paper: The level of urban population is a crucial determinant of the DT date. In particular, the larger a country's urban population, the earlier it reaches this date. The effect is unchanged if one adds total population as a regressor. Indeed, it is interesting to notice that total population never has a significant effect; only the urban population does, which is consistent with the idea that technological progress and/or the demand for human capital originates in cities. Using the urbanization rate, defined as the ratio of urban population to total population, leads to similar results. I choose to include both regressors separately, however, because it is less restrictive.

One may argue that it is urban density rather than urban population that really matters to triggering a demographic transition. I define total and urban densities as the ratio of total and urban population and land, respectively, and use these variables instead of total population and urban population in regression (2).¹² Table 3 shows that none of the results changes significantly. A country's total density does not significantly correlate with its DT date once one controls for the country's level of income. Urban density, in contrast, has a strong negative effect on this date. When one adds the two densities together, the signs are preserved, although now the positive effect of total density is statistically significant, probably because, by construction, the two densities are strongly correlated.

¹² Data on country size are from *City Population* at <http://www.citypopulation.de/>.

Table 3: The Effect of Per-Capita GDP and Total and Urban Density on the Timing of the Demographic Transition Using PWT Data

	[1]	[2]	[3]
log of Average GDPpc	0.002** (0.0007)	0.002*** (0.0007)	0.004*** (0.0009)
log of Avg Total Density	-0.0005 (0.0005)		0.005*** (0.001)
log of Avg Urban Density		-0.001*** (0.0005)	-0.006*** (0.001)
constant	7.58*** (0.005)	7.58*** (0.004)	7.56*** (0.007)
Method of estimation	OLS	OLS	OLS
Number of observations	79	79	79
R ²	0.06	0.13	0.3

Note: Robust standard errors are in parentheses. **,*** denote significance at the 5% and 1% levels, respectively.

The distinction between urban population and urban density raises an interesting question. Is it the absolute or the relative (relative to the country's size) urban population that matters as a trigger of the DT? This paper does not offer a conclusive answer, but I argue that urban density may be a misleading indicator of the amount of productive activities that take place in urban areas. A small country that is mostly rural may have very high urban (or total) density. In contrast, a very large country with a small number of large cities will display a very low ratio. However, one might argue that the level of urban activities, technological progress for instance, is probably higher in the latter. In other words, it may not really matter if a large fraction of the country's population lives in rural areas as long as there are enough people in the cities (inventing new things and boosting the demand for human capital). In any case, distinguishing between the roles of the total vs. relative urban population in promoting technological progress in cities, while interesting in its own, is outside the scope of this paper.

The role of infant mortality

According to classic transition theories that demographers often postulate, mortality declines appear to play a central role in the decline of fertility, and hence in triggering the DT.¹³ This argument has also been defended by some economists who incorporate a precautionary demand for children in their models. Consider a setup with an uncertain, positive rate of infant mortality. If one assumes that households have an ideal amount of children, it is optimal for them to have an offspring larger

¹³ See, for instance, Coale (1973) and van de Walle (1986). Galloway et al. (1998) analyze the link between infant mortality and the fertility transition in Europe and discuss the case study of Prussia.

than this number to ensure that the surviving number of children approaches their optimal one. It is then natural to argue that the secular decline in infant mortality may have induced a significant decline in the number of born children. This decline may, at some point, have triggered a DT. Sah (1991), Kalemli-Ozcan (2002), Tamura (2006), and Cuberes and Tamura (2009) are examples of models that incorporate a precautionary demand for children. The empirical validity of such a precautionary motive, although still an open question, has been criticized on theoretical and empirical grounds by Galor (2005), Fernandez-Villaverde (2001), and Doepke (2005), among others.¹⁴ Table 4 shows the results that include the infant mortality rate as an additional regressor.

Table 4: The Additional Effect of Infant Mortality

	[1]	[2]	[3]	[4]
log of Average GDPpc	0.003*** (0.0009)	0.003*** (0.001)	0.005*** (0.001)	0.005*** (0.001)
log of Avg Infant Mortality	0.008*** (0.002)	0.008*** (0.002)	0.007*** (0.001)	0.007*** (0.001)
log of Avg Total Population		-0.0006 (0.0004)		-0.0004 (0.0005)
log of Avg Urban Population			-0.005*** (0.0009)	-0.005*** (0.0009)
constant	7.53*** (0.01)	7.54*** (0.02)	7.52*** (0.01)	7.53*** (0.02)
Method of estimation	OLS	OLS	OLS	OLS
Number of observations	79	79	79	79
R ²	0.3	0.3	0.46	0.47

*Note: Robust standard errors are in parentheses. *** denotes significance at the 1% level.*

These estimates indicate that countries with a higher infant mortality rate tend to experience a later DT. Interestingly, the sign and significance of the other regressors are unaffected. In particular, a larger urban population is still associated with an earlier DT. While formally testing the empirical relevance of the precautionary demand for children is outside the scope of this paper, this result seems to indicate that the secular decline in infant mortality plays an important role in triggering the DT in today's developing countries. One possible theoretical mechanism through which this may have happened is the existence of such a precautionary motive in the utility function of parents.¹⁵

¹⁴ In contrast, Eckstein et al. (1999) show that mortality decline played a role in the demographic transition in Sweden.

¹⁵ It is also important to point out that it is not the goal of this paper to provide conclusive empirical evidence to dismiss or favour economic vs. non-economic factors as determinants of DTs. While interesting in its own right, a lack of data on the relevant variables, mainly cultural ones, and space leaves this for further research.

The main finding of this section is that urban population is a key trigger factor of DTs, even after controlling for a country's per-capita GDP and other indicators, such as total population and infant mortality rate. This supports the view that the transition from rural to urban societies may indeed be more important than the society's wealth in explaining this structural change, especially in transitions that today's developing countries have experienced. My results cannot disentangle the specific mechanism through which this occurs. It may be that the more expensive life in cities triggers a switch from an emphasis on the quantity to the quality of children. Another possible story is that positive spillovers among people living in cities induce rapid technological change (as in Galor and Weil 2000) or enhance the construction of schools (as in Boucekine et al. 2007), with a subsequent switch in emphasis from the quantity to the quality of children.

In any case, the estimates above are consistent with income and urbanization being substitute triggers of DTs. Although one needs more accurate data on urbanization to formally test this, it is a fact that the rural-urban migration process was at its early stages when the forerunners experienced their DTs. In most countries, this rural-urban process has continued at a more or less constant rate since then. This implies that the degree of urbanization in the countries that experienced early DTs must have been relatively low compared to countries that experienced them in the last fifty years. This can be rationalized with a model that suggests that this much higher degree of urbanization acts as a substitute for high income that triggers DTs in today's developing countries. The next section explores this issue in more detail.

4.2. Relative Economic Development and Urbanization around the Demographic Transition Years

In this section I attempt to answer the following two questions. First, at what point of their development process do countries reach their DT? Second, is this critical *relative* level of development consistently different between forerunner countries--those that experienced a transition in the late-nineteenth or early-twentieth century--and latecomers?

To address these points, I first calculate the world's average income (using Maddison data) for every year during the 1850-2000 period. Figure 1 shows the evolution of this variable over time, which, perhaps not surprisingly, exhibits a clear positive trend.

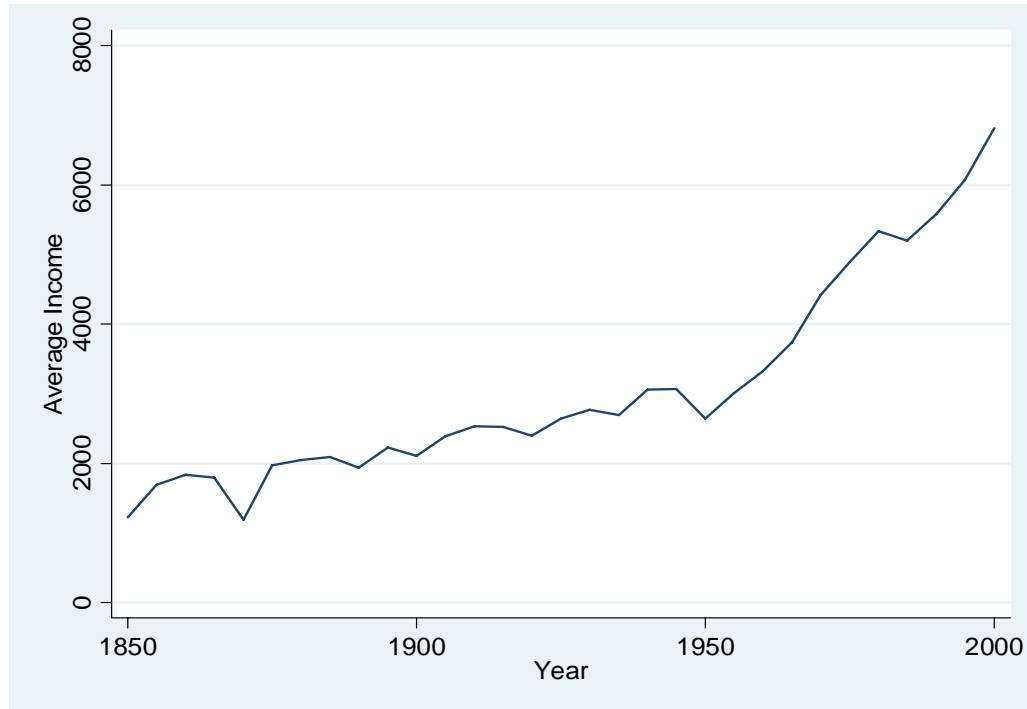


Figure 1: Evolution of Average World Income over Time

Next I calculate the income, relative to the world's average, of each country in the year of its DT. Finally, I plot this relative income against the DT year. Figure 2 shows that the relation between the two variables is clearly negative.¹⁶ The correlation coefficient is -0.49, which is significant at the 1% level.

¹⁶ In results not reported here, I show that Qatar is a clear outlier in the sample. It experienced the demographic transition in 1955, but its relative income was extremely high at that point in time. Including Qatar, the correlation coefficient between the two variables is -0.3, significant at the 1% level.

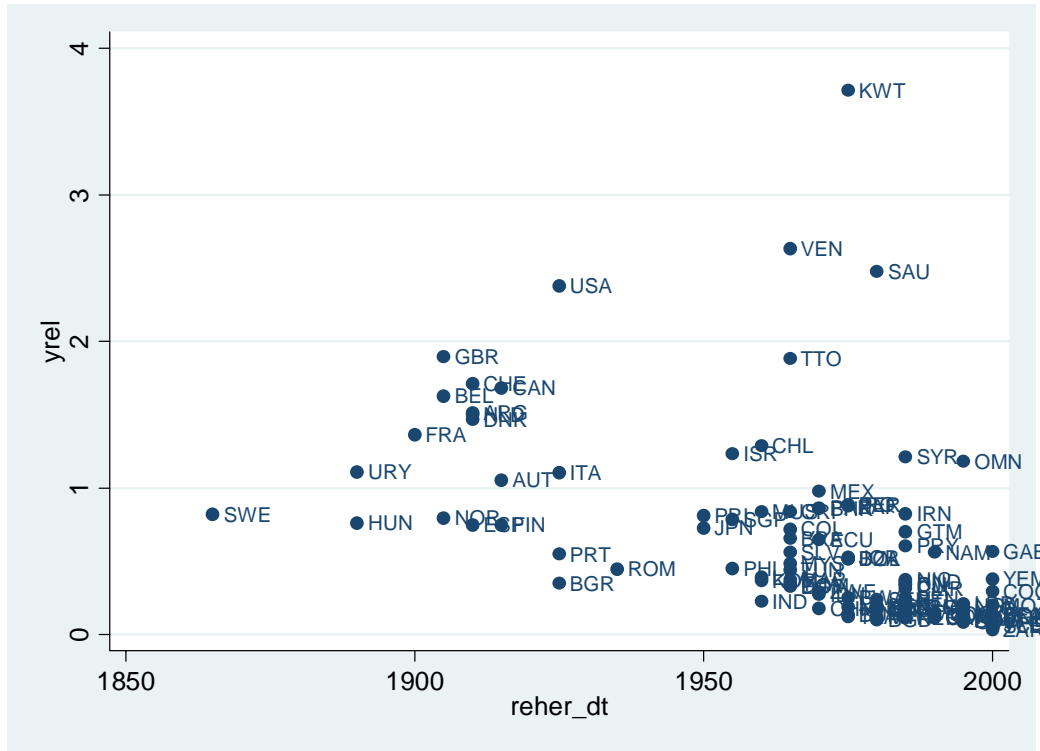


Figure 2: Relative Income in the Demographic Transition Year

These calculations show that countries that experienced the DT relatively late did so at a much lower level of development than those who did it earlier on.¹⁷ Another way to see this is to calculate the average relative income year of countries with “early” and “late” transitions. Table 5 shows that the relative per-capita income of the average frontrunner is above 1, indicating that it is relatively rich. In contrast, the average latecomer is a poor country (its relative income is clearly below 1).

Table 5: Relative Income in Early and Late Demographic Transitions

	Early Transitions	Late Transitions
Average Relative Income	1.04	0.32
Number of Countries	61	48

Note: A transition is classified as “early” if it takes place prior to 1980, and “late” otherwise.

¹⁷ Oman, Saudi Arabia, and Syria are the only countries that they were relatively rich when they experienced a late demographic transition.

4.3. Income and Urbanization as Substitute Triggers of the Demographic Transition

Section 4.1 shows that the size of a country's urban population is an important factor to explain cross-country differences in the timing of recent (i.e., after 1950) DTs. Although because of a lack of accurate data on urban population it is not possible to test whether GDP or urbanization was the key trigger of early DTs, the fact that early DTs took place at a relatively high level of y and the late ones occurred at relatively low levels of y is consistent with income being the key factor in early DTs but not late ones.

As argued above, this can be rationalized with the following story: In today's developing countries, urbanization can be seen as a "substitute trigger" for income. One obvious caveat is that it is not clear which effect is attributable to per-capita GDP or urbanization, because the two are highly correlated in the sample.¹⁸ However, my results highlight three reasons why urbanization seems to be a more important determinant, especially for latecomers. First, results in Table 1 suggest that the impact of income, while negative for the entire sample, it is definitely more so for early transitions. Second, Table 2 shows that, when put together in a regression that mostly uses latecomers, urbanization has a larger impact than income on the predicted DT date.¹⁹ Finally, Figure 2 confirms that countries' *relative* income was high in early transitions and low in late ones.

5. Conclusions

Disentangling the main determinants of demographic transitions in today's developing countries is extremely important for both academics and policymakers. This paper aims to draw lessons from early demographic transitions for more recent ones, using a new dataset on demographic transition dates for what we now call developed and developing countries.²⁰

The results suggest that the size of a country's urban population is a key variable to explain cross-country differences in the timing of these transitions. Even after controlling for income, total population, and infant mortality rates, more urbanized countries tend to experience the demographic transition earlier. Moreover, the importance of income as a trigger factor is much lower in late transitions (i.e., 1980 or later) than in early ones. One interpretation of these findings is that today's developing countries can afford to experience their demographic transitions at relatively low levels of development. The fact that they are very urbanized is enough to trigger this change.

¹⁸ The correlation coefficient is 0.6, which is significant at the 1% level.

¹⁹ Moreover, in regressions that include urbanization alone its estimated coefficient (-0.003) is larger than that of income (0.002). The R^2 is also higher if one uses only urbanization as a regressor (0.09 vs. 0.048).

²⁰ This is similar in spirit to the Unified Growth Theory, which aims to establish a relation between early growth takeoffs (at the dawn of the nineteenth century) and modern ones (post 1950). See Galor (2005).

References

- Au, C.-C., and J. V. Henderson (2006), “Are Chinese Cities Too Small?” *Review of Economic Studies*, vol. 73(3), pp. 549-76
- Boserup, E. (1981), *Population and Technological Change: A Study of Long-Run Trends*, Chicago: University of Chicago Press
- Boucekkin, R., D. de la Croix, and D. Peeters (2007), Early Literacy Achievements, Population Density and the Transition to Modern Growth, *Journal of the European Economic Association*, 5, pp. 183-226
- Bulatao, R. A., and R. D. Lee (1983), *Determinants of Fertility in Developing Countries*. New York
- Carlino, G. A., S. Chatterjee, and R. M. Hunt (2007), “Urban Density and the Rate of Invention.” *Journal of Urban Economics* 61, pp. 389-419
- Ciccone, A. and R. E. Hall (1996), “Productivity and the Density of Economic Activity.” *American Economic Review*, vol. 86, March, No. 1, pp. 54-70
- *City Population*, <http://www.citypopulation.de/>
- Coale, A. J. (1973), “The Demographic Transition.” in *International Population Conference*, vol. 1, International Union for the Scientific Study of Population: Liege, pp. 53-72
- Cuberes, D. (2009), “Urban Primacy and the Demographic Transition.” Working paper, University of Alicante
- Cuberes, D. and R. Tamura (2009), “The Gaps Between Equilibrium and Efficient Fertility and Human Capital Investment.” Working paper
- Defo, B.K. (1998), “Fertility Response to Infant and Child Mortality in Africa with Special Reference to Cameroon.” Chapter 8 in *From Death to Birth: Mortality Decline and Reproductive Change*, edited by M. R. Montgomery, B. Cohen (ed). Washington, D.C: National Academy Press
- de la Croix, D., T. Lindh and B. Malmberg (2008), “Swedish Economic Growth and Education Since 1800.” *Canadian Journal of Economics* 41, pp. 166-85
- Doepke, M. (2005), “Child Mortality and Fertility Decline: Does the Barro-Becker Model Fit the Facts?” *Journal of Population Economics*, 18, pp. 337-66
- Eckstein, Z., Mira, P., Wolpin, K. (1999), “A Quantitative Analysis of Swedish Fertility Dynamics: 1751-1990.” *Review of Economic Dynamics*, 2, pp. 137-65.

- Fernandez-Villaverde, J. (2001), "Was Malthus Right? Economic Growth and Population Dynamics." unpublished manuscript, University of Pennsylvania
- Galloway, P.R., R. D. Lee, and E. A. Hammel (1998), "Infant Mortality and the Fertility Transition: Macro Evidence from Europe and New Findings from Prussia." Chapter 6 in *From Death to Birth: Mortality Decline and Reproductive Change*, edited by M. R. Montgomery, B. Cohen (ed). Washington, D.C: National Academy Press
- Galor, O. (2005), "From Stagnation to Growth: Unified Growth Theory." *Handbook of Economic Growth*, Vol. 1A, chapter 4, edited by P. Aghion and S. N. Durlauf
- Galor, O. and D. N. Weil (2000), "Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond." *American Economic Review* 90 (4), pp. 806-28
- Greenwood, J., and A. Seshadri (2002), "The U.S Demographic Transition." *American Economic Review Papers and Proceedings* 92 (2), pp. 153-59
- Harbison, S. (2005), "Completing the Demographic Transition in Developing Countries: What does Quality Have to Do with It?" *Office of Population and Reproductive Health*, USAID, Washington, DC
- Heston, A., R. Summers and B. Aten (2006), *Penn World Table Version 6.2*, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September
- Hill, J, and A. R. Pebley (1989), "Child Mortality in the Developing World." *Population and Development Review*, vol. 15, No. 4, December, pp. 657-87
- Kalemli-Ozcan, S. (2002), "Does the Mortality Decline Promote Economic Growth?" *Journal of Economic Growth*, 7 (4), pp. 411-39
- Kirk, D. (1996), "Demographic Transition Theory." *Population Studies*, 50, pp. 361-87
- Kremer, M. (1993), "Population Growth and Technological Change: One Million B.C. to 1990." *Quarterly Journal of Economics* 108, pp. 681-716
- Maddison, A. (2003), *The World Economy: Historical Statistics*, OECD, Development Centre Studies
- Manuelli, R. E. and A. Seshadri (2009), "Explaining International Fertility Differences." *Quarterly Journal of Economics*, vol. 124(2), May, pp. 771-807

- Parente, S. L. and E. C. Prescott (2000), *Barriers to Riches*, MIT Press: Cambridge, MA
- Ray, D. (1998), *Development Economics*, Princeton University Press
- Reher, D. S. (2004), "The Demographic Transition Revisited as a Global Process." *Population, Space, and Place* 10, pp. 19-41
- Rosero-Bixby, L. (1998), "Child Mortality and the Fertility Transition: Aggregated and Multilevel Evidence from Costa Rica." Chapter 11 in *From Death to Birth: Mortality Decline and Reproductive Change*, edited by M. R. Montgomery, B. Cohen (ed). Washington, D.C: National Academy Press
- Rutstein, S., and V. Medica (1978), "The Latin America Experience." in *The Effects of Infant and Child Mortality on Fertility*, edited by S. H. Preston (ed). New York: Academic Press
- Sah, R. K. (1991), "The Effects of Child Mortality Changes on Fertility Choice and Parental Welfare." *Journal of Political Economy* 99 (3), pp. 582-606
- Soares, R. R (2007), "On the Determinants of Mortality Reductions in the Developing World." *Population and Development Review*, 33 (2), June, pp. 247-87
- Tamura, R. (2006), "Human Capital and Economic Development." *Journal of Development Economics* 79, pp. 26-72
- van de Walle, F. (1986), "Infant Mortality and the European Demographic Transition." in *The Decline of Fertility in Europe*, Coale, A. J., and S. C. Watkins (eds). Princeton University Press: Princeton. pp. 201-33
- United Nations Statistics Division (2000), *Demographic Yearbook, Historical Supplement 1948-1997*
- Wolpin, K. I. (1997), "Determinants and Consequences of the Mortality and Health of Infants and Children." *Handbook of Population and Family Economics*, Vol. IA, chapter 10, edited by M. R. Rosenzweig, and O. Stark (ed.), pp. 483-557
- World Bank (1993), *Investing in Health*. World Development Report
- World Development Indicators (2009), *The World Bank*
- World Urbanization Prospects: The 2005 Revision Population Database

Appendix

Table 1A: Reher's (2004) Predicted Transition Dates

Country	Year
Algeria	1975
Angola	1995
Argentina	1910
Austria	1915
Bahamas	1965
Bahrain	1970
Bangladesh	1980
Barbados	1955
Belgium	1905
Belize	1965
Benin	1985
Bhutan	1995
Bolivia	1975
Botswana	1975
Brazil	1965
Bulgaria	1925
Burkina Faso	2000
Burundi	1995
Cameroon	1985
Canada	1915
Central African Republic	1990
Chad	2000
Chile	1960
China	1970
Colombia	1965
Comoros	1990
Congo	2000
Costa Rica	1965
Cote d'Ivoire	1985
Democratic Republic of Congo	2000
Denmark	1910
Djibouti	1985
Dominican Republic	1965
Ecuador	1970
Egypt	1965
El Salvador	1965
Ethiopia	1990
Finland	1915
France	1900
Gabon	2000
Gambia	1985
Germany	1900
Ghana	1985
Guatemala	1985

Table 1A (continued)

Guinea	1995
Guinea-Bissau	2000
Guyana	1965
Haiti	1985
Honduras	1985
Hungary	1890
India	1960
Indonesia	1970
Iran	1985
Iraq	1975
Israel	1955
Italy	1925
Jamaica	1925
Japan	1950
Jordan	1975
Kenya	1980
Kuwait	1975
Laos	1995
Lesotho	1985
Liberia	1995
Madagascar	1990
Malawi	1980
Malaysia	1965
Mali	1995
Mauritania	1980
Mauritius	1960
Mexico	1970
Mongolia	1975
Morocco	1965
Mozambique	2000
Myanmar	1975
Namibia	1990
Nepal	1995
Netherlands	1910
Nicaragua	1985
Niger	1985
Nigeria	1995
Norway	1905
Oman	1995
Panama	1970
Paraguay	1985
Peru	1975
Philippines	1955
Portugal	1925
Puerto Rico	1950
Qatar	1955
Romania	1935
Rwanda	1995
Saudi Arabia	1980
Senegal	1980

Table 1A (continued)

Sierra Leone	2000
Singapore	1955
Somalia	2000
South Africa	1975
South Korea	1960
Spain	1910
Sri Lanka	1960
Sudan	1980
Suriname	1965
Sweden	1865
Switzerland	1910
Syria	1985
Tanzania	1975
Thailand	1965
Togo	1995
Trinidad and Tobago	1965
Tunisia	1965
Uganda	2000
United Kingdom	1905
Uruguay	1890
USA	1925
Venezuela	1965
Yemen	2000
Zambia	1980
Zimbabwe	1970

Table 2A: Early and Late Demographic Transitions

Early Transitions		Late Transitions	
Country	Reher's Transition Date	Country	Reher's Transition Date
Algeria	1975	Angola	1995
Argentina	1910	Bangladesh	1980
Austria	1915	Benin	1985
Bahrain	1970	Burkina Faso	2000
Belgium	1905	Burundi	1995
Bolivia	1975	Cameroon	1985
Botswana	1975	Central African Republic	1990
Brazil	1965	Chad	2000
Bulgaria	1925	Comoros	1990
Canada	1915	Congo	2000
Chile	1960	Cote d'Ivoire	1985
China	1970	Democratic Republic of the Congo	2000
Colombia	1965	Djibouti	1985
Costa Rica	1965	Gabon	2000
Denmark	1910	Gambia	1985
Dominican Republic	1965	Ghana	1985
Ecuador	1970	Guatemala	1985
Egypt	1965	Guinea	1995
El Salvador	1965	Guinea-Bissau	2000
Finland	1915	Haiti	1985
France	1900	Honduras	1985
Hungary	1890	Iran	1985
India	1960	Kenya	1980
Indonesia	1970	Laos	1995
Iraq	1975	Lesotho	1985
Israel	1955	Liberia	1995
Italy	1925	Madagascar	1990
Jamaica	1925	Malawi	1980
Japan	1950	Mali	1995
Jordan	1975	Mauritania	1980
Kuwait	1975	Mozambique	2000
Malaysia	1965	Namibia	1990
Mauritius	1960	Nepal	1995
Mexico	1970	Nicaragua	1985
Mongolia	1975	Niger	1985
Morocco	1965	Nigeria	1995
Myanmar	1975	Oman	1995
Netherlands	1910	Paraguay	1985
Norway	1905	Rwanda	1995
Panama	1970	Saudi Arabia	1980
Peru	1975	Senegal	1980
Philippines	1955	Sierra Leone	2000
Portugal	1925	Somalia	2000
Puerto Rico	1950	Sudan	1980
Qatar	1955	Syria	1985
Republic of Korea	1960	Uganda	2000
Romania	1935	Yemen	2000
Singapore	1955	Zambia	1980
South Africa	1975		
Spain	1910		
Sri Lanka	1960		
Sweden	1865		
Switzerland	1910		
Tanzania	1975		
Thailand	1965		
Trinidad and Tobago	1965		
Tunisia	1965		
United Kingdom	1905		
United States of America	1925		
Uruguay	1890		
Venezuela	1965		
Zimbabwe	1970		

Note: A transition is classified as "early" if it takes place prior to 1980 and "late" otherwise.

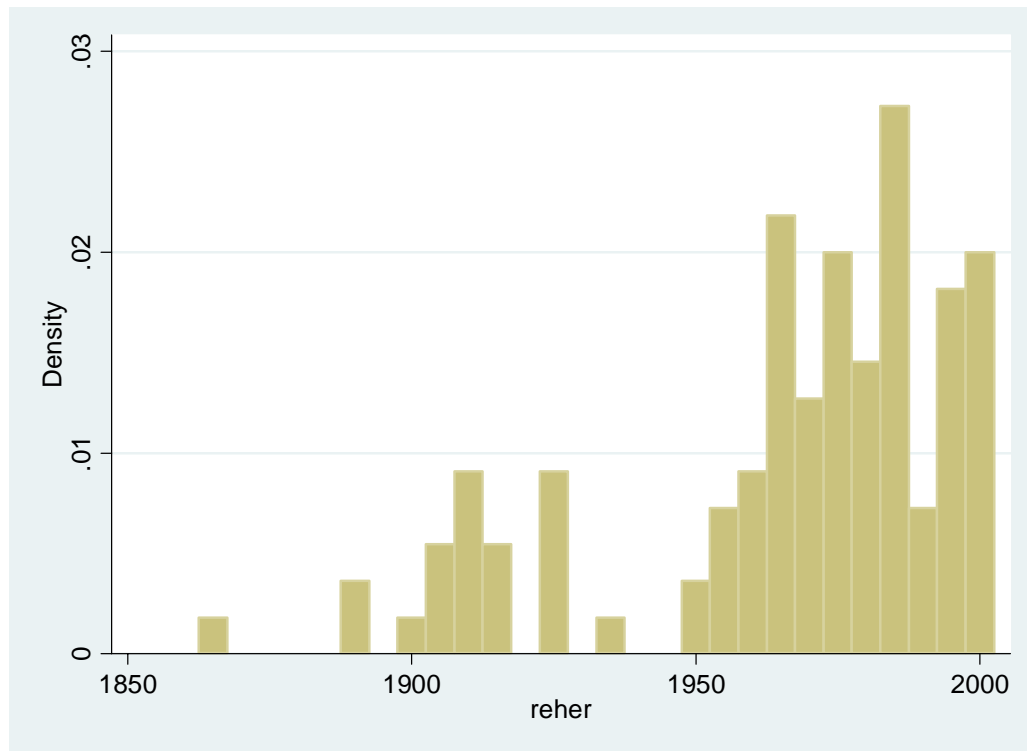


Figure 1A: Histogram of Reher's Demographic Transition Dates

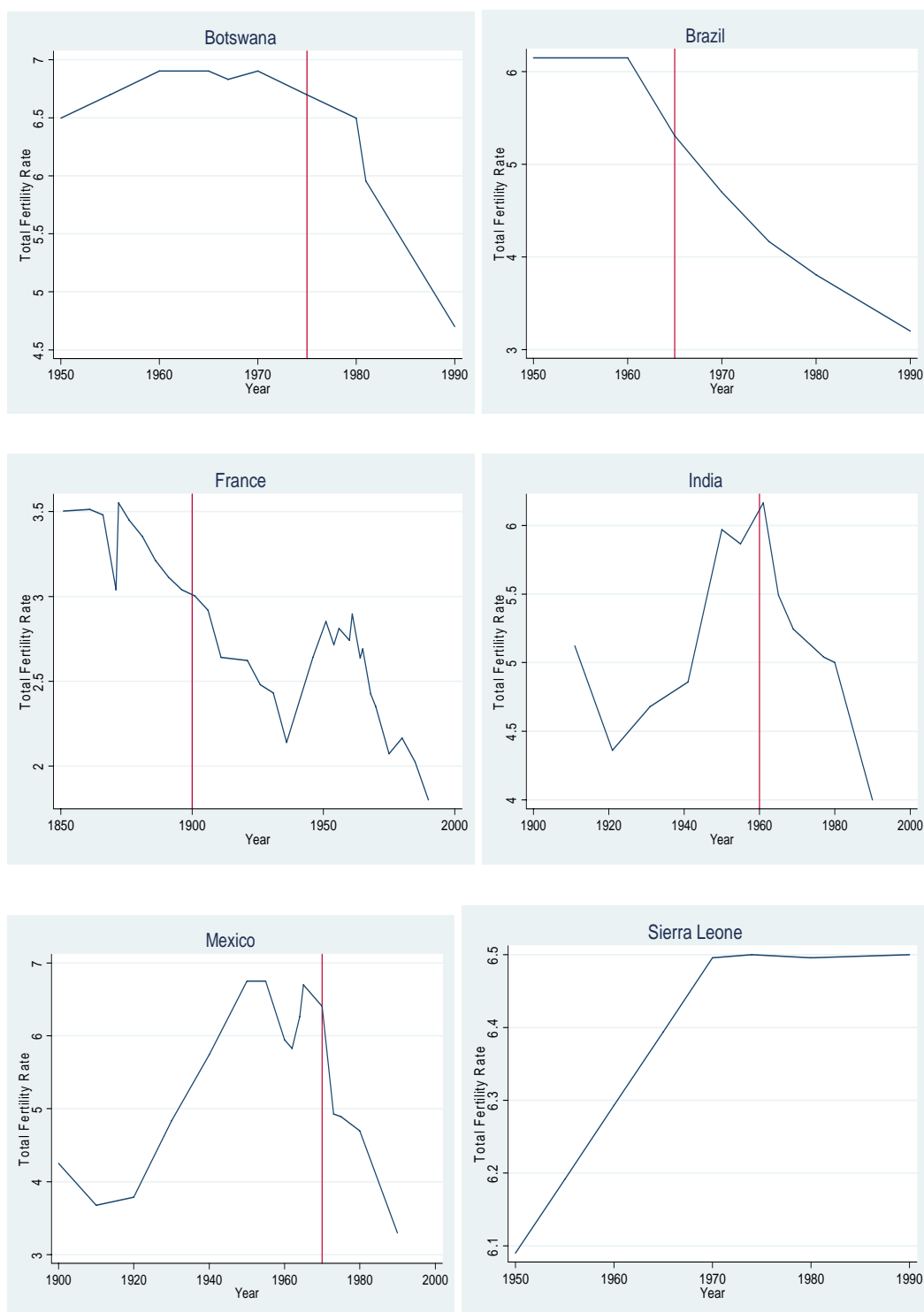


Figure 2A: Some Examples of Reher's Demographic Transition Dates